IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:		§	
	Chris Boyer, et al	§	Group Art Unit: 1745
		§	
Serial No.:	10/727,813	§	
		§	
Filed:	December 4, 2003	§	Examiner: Shermanda L. Williams
		§	
For:	Fuel Cell With Recombination Catalyst	§	

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

INFORMATION DISCLOSURE STATEMENT

Pursuant to the duty of candor and good faith set forth in 37 C.F.R. § 1.56, the Applicant hereby discloses on behalf of individuals associated with the filing and prosecution of the present patent application information that might be material to patentability. This disclosure is presented via the enclosed Form PTO-1449.

This disclosure is not intended to constitute an admission that any information is "prior art" with respect to the presently claimed invention.

Copies of the patents and publications cited among the disclosed information are enclosed herewith, with the exception of U.S. Patents & U.S. Patent Applications the requirement for copies of which has been waived by the Office Notice of July 11, 2003 (*if the present patent application was filed after June 30, 2003*).

In the event a fee is required in connection with the enclosed Information Disclosure Statement, the Commissioner of Patents and Trademarks is authorized to charge Deposit Account No. 50-0714/LYNN/0165 for the necessary amount.

Respectfully submitted,

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U.S. Department of Commerce, Patent and Trademark Office	Docket No.	Serial No.
	LYNN/0165	10/727,813
LIST OF RELEVANT ART CITED BY APPLICANT	Applicant	
(Use several sheets if necessary)	Chris Boyer, et al	
	Filing Date	Group
	December 4, 2003	1745

U.S. Patent Documents

*Examiner Initial		Document Number	Issue Date	Name	Class	Subclass	Filing Date If Appropriate

Foreign Patent Documents

							Translation	
		Document Number	Date	Country	Class	Subclass	Yes	No

OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	A	MPI Invention Disclosure ID #: 0050; 4 pages; "Hydrogen Management System for a Zinc Regenerative Fuel Cell; inventors Stuart I. Smedley and Steve des Jardins.

Examiner	Date Considered

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with your communication to applicant.

INVENTION DISCLOSURE

1.	TITLE:	Hydrogen Management System For A Zinc Regenerative Fuel Cell

2. DESCRIPTION:

(Please write as full of a description as possible, expand block as needed)

A zinc fuel cell contains zinc particles in contact with potassium hydroxide electrolyte and because of a corrosion reaction between the zinc and water, hydrogen is always evolved. For pure zinc the corrosion rate is quite slow even at 65 C, 0.5 ml/g/h and even less in some zinc metal alloys. However the Metallic Power fuel cell contains up to 40 kg of zinc in constant contact with KOH so that over time the total amount of hydrogen produced can lead to a significant loss of water. Loss of water will eventually reduced the amount of energy the fuel cell can produce, and hydrogen accumulation in the fuel cell or in cabinet housing the fuel cell could increase the risk of explosion. For these two reasons the Metallic Power Regenerative Zinc Fuel Cell (RZFC) incorporates a hydrogen management system whose function is to convert as much hydrogen as possible back to water inside the fuel cell, and to remove any hydrogen which is not converted to water from the fuel cell and its housing.

Method Of operation

Hydrogen produced by the reaction of zinc and water in the cell stack is transported by the flowing electrolyte to the fuel and electrolyte tank where it accumulates in the head space. Hydrogen produced by the reaction of zinc and water in the fuel and electrolyte tank accumulates in the head space.
The only outlet for gasses from the head space is through a hydrogen recombination catalyst where the hydrogen reacts with oxygen to form water. Oxygen can be provided from several sources. One source is by natural diffusion of oxygen from the atmosphere into the catalyst. Another source can be provided by pumping air into the fuel and electrolyte tank head space. The pump could be programmed to provide oxygen in slight excess of the known rate of hydrogen evolution at any given temperature. Alternatively the air supply pump could be programmed to operate continuously during the discharge and higher electrolyte temperature phase of operation, and periodically or at a lower rate during standby and lower temperature mode of operation, but at a rate known to provide a slight excess of oxygen. Another approach to controlling the pump could be to operate the air feed rate so as to maintain the highest temperature in the recombination catalyst (the recombination of hydrogen and oxygen is exothermic).

Another source of oxygen for recombination with hydrogen is from the zinc regeneration unit. The regeneration unit produces zinc pellets by electroreduction of potassium zincate on the cathode and oxygen is produced at the anode. During standby periods the zinc regeneration unit could be powered by electricity from the grid, the amount of oxygen produced can be controlled by the electric current. The required current could be calculated from the known corrosion rate at a given temperature, or could be adjusted to result in the maximum temperature for the recombination catalyst. During periods of normal fuel cell operation the regeneration unit would be powered by electricity generated by the fuel cell.

Any hydrogen which passed through the recombination catalyst can be expelled into the atmosphere external to the fuel cell housing. It could also be combined with the fuel cell exhaust air and expelled into the atmosphere external to the fuel cell housing.

The regeneration unit primarily produces zinc pellets and oxygen, however a small amount of hydrogen is also liberated on the cathode, this amounts to less than 1% of the total current. Any hydrogen produced during regeneration of zinc will be recombined with the oxygen on the recombination catalyst. Also oxygen produced during regeneration could be collected and stored for further use in hydrogen recombination during period of standby and normal fuel cell discharge.

2.	CLAIM(S):

1) A hydrogen management system for a metal-gas fuel cell comprising an apparatus for combining the hydrogen with oxygen from one or more of the following sources: ambient air, an oxygen storage compartment, a metal electrolyzer.

4.	INVENTORS:	
	Name:	Stuart I Smedley
	Name:	Steve des Jardins

[redacted]